



# **Observer User Manual Addendum**

## *802.11b Wireless Installation & Operation*

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# Observer<sup>®</sup> Software and Wireless LANs

## *An Addendum to the Network Instruments Observer User Manual*

To use Observer in an 802.11b wireless environment, you must follow the instructions for custom driver installation (see below) and Observer setup (see page 6 of this manual).

## Hardware & Software Support

### Supported NICs

- Symbol Spectrum24 - 41x1 models
- Nortel 41x1 models
- Cisco Aironet 340-350 series models
- Intel 2011b models

### Supported Microsoft Windows Versions

- 2000
- XP

## Network Instruments Custom Driver Installation

For Observer to properly analyze 802.11b wireless packets, the driver must pass through *all* of the packets, not just those packets addressed to that NIC (i.e., it must put the card in 'promiscuous' mode). Observer must also have access to the 'raw' 802.11b wireless packets.

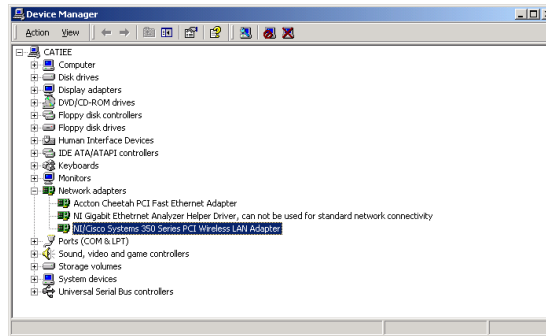
Because standard wireless drivers do not support either raw *or* promiscuous mode, NI has written a custom driver so that you can use Observer as a wireless protocol analyzer.

Before you install the driver, you must:

- Verify that the NIC is operating correctly with the *manufacturer-supplied driver* as described in the manufacturer's installation instructions.
- Install Observer. Refer to the *Observer User Manual* for details. You must install Observer so that you can update the NIC driver from the Observer directory.

To update the driver, follow these steps:

1. Right-click on the 'My Computer' icon and choose **Properties**.
2. Click the **Hardware** tab and then the **Device Manager...** button to display the Device Manager:

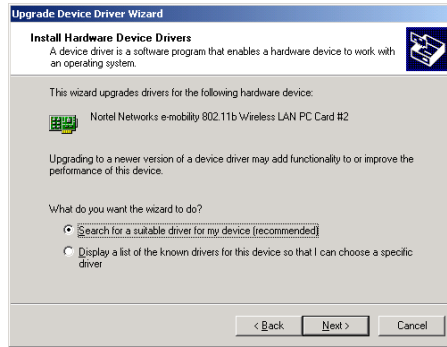


3. Right-click on the wireless driver (e.g. Nortel Networks e-mobility) and choose **Properties**.
4. Click on the **Driver** tab and then click the **Update Driver...** button. This starts the Update Hardware Wizard:

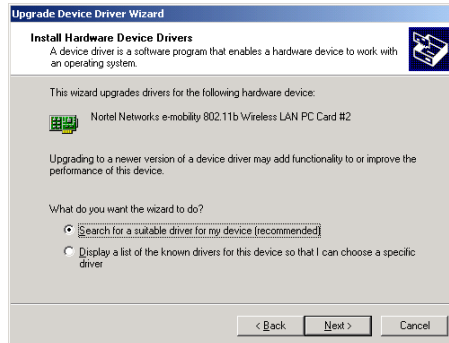


5. Click **Next**.

The Wizard asks you how you want to update the driver:



6. Choose “Search for a suitable driver for my device (recommended)” and click **Next**. The Wizard asks where you want to search for the driver:



7. Choose “Specify a location” and click **Next**.

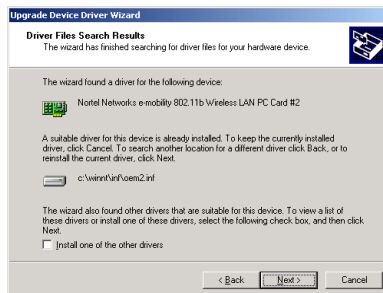
A file locator dialog is displayed:



8. Enter (or browse to) the following directory (assuming that **C:\Observer Files** is your Observer directory):

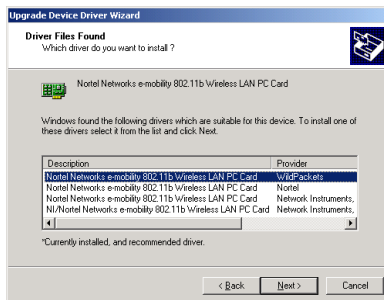
**C:\Observer Files\drivers\wireless**

The Wizard displays the following:



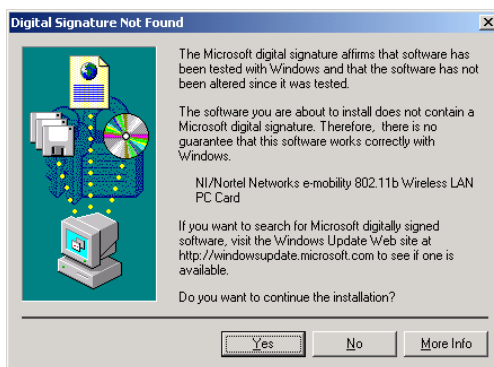
9. Choose “Install one of the other drivers” and click **Next**.

The wizard displays a list of compatible drivers:



10. Choose the appropriate analyzer driver with the “NI” prefix (“NI/Nortel Networks e-mobility 802.11b Wireless LAN PC Card,” for example) and click **Next**.\*

The Wizard informs you that the driver lacks a Microsoft digital signature:



11. Click **Yes**. Network Instruments has tested the driver and verified that it works with Windows and with Observer. When the installation is complete, click **Finish** to close the Wizard.

Note that you can switch wireless operation between analyzer (i.e., “promiscuous”) mode and standard NIC mode without re-installing the driver.


\*The table below shows what driver to select for each of the supported wireless NICs:

NIC	Analyzer Driver
Symbol Spectrum24 - 41x1 models	<b>NI/Symbol LA-41x1 [or 41x3] Spectrum24 Wireless LAN PCMCIA [or PCI] Card Driver</b>
Nortel 41x1 models	<b>NI/Nortel Networks e-mobility 802.11b Wireless LAN PC [or PCI] Card Driver</b>
Cisco Aironet 340-350 series models	<b>NI/Cisco Systems 340 [or 350] Series PCMCIA [or PCI] Wireless LAN Adapter</b>
Intel 2011b models	<b>NI/Intel(R) PRO/Wireless [or PRO/11 Wireless] 2011 LAN PC [or PCI] Card Driver</b>

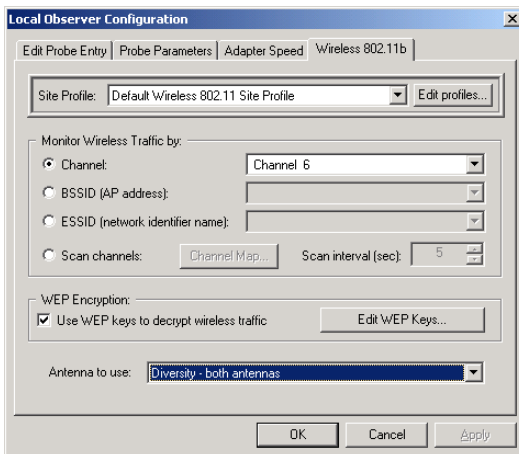
## Configuring Observer for Wireless Operation

Once you have installed the wireless NIC and Network Instruments' custom driver, you will be able to see the wireless Probe in the Probe List. Check the setup options before you begin capturing packets.

1. Start Observer. If the new wireless card is the only installed NIC in your system, the wireless Probe will appear in the Probe List under the Wireless Advanced Probes heading.

If the wireless card is installed along with other NICs, you may have to **Select a Different Network Adapter** by choosing that option from the **Tools** menu (or by clicking the NIC icon  on the toolbar). Observer will display the list of available cards. Select the NI Analyzer driver for your wireless NIC.

2. Once the wireless Probe appears in the Probe list, right click on it and choose **Probe or Device Properties...**, which displays the **Local Observer Configuration** dialog.
3. Click on the 802.11b tab to display wireless properties:



4. Set the wireless configuration options to match your network.

Note that if your wireless network is configured for WEP, you **must** activate WEP and enter the WEP key(s) in the Edit WEP Keys dialog in Observer.

The configuration options are described below:

Option	Description	
Site Profiles	Site Profiles let mobile users save and retrieve wireless parameters, rather than re-keying the parameters every time you change sites.	
Monitor Traffic By	Choose the method to monitor traffic. The three available methods are as follows (choose one):	
	<b>Channel</b>	Specify a channel to monitor.
	<b>BSSID</b>	Specify the Basic Service Set ID of the Access Point you want to monitor.
	<b>ESSID</b>	Specify the Extended Service Set ID of the network you want to monitor.
	<b>Scan Channels</b>	(Only available if you have chosen to monitor by Channel) Scan the selected channels. To select channels to scan, click <b>Channel Map...</b>
WEP Encryption	Choose Wireless Equivalency Privacy encryption settings. To use WEP, check the "Use WEP keys to decrypt wireless traffic" checkbox and click <b>Edit WEP Keys...</b> to enter the appropriate encryption keys.	
Antenna to use	Specify the type of antenna connected to your system:	
	<b>Antenna Diversity</b>	Use the stronger signal from the two antenna ports. This is the recommended setting for the standard snap-on antenna.
	<b>Primary Antenna Only</b>	If you are not using the standard snap on antenna, choose this option if the antenna you are using is connected to the primary antenna port (see your NIC manual for details).
	<b>Secondary Antenna Only</b>	If you are not using the standard snap on antenna, choose this option if the antenna you are using is connected to the secondary antenna port (see your NIC manual for details).

## New Features for Wireless Support

In addition to decoding and analyzing 802.11b wireless LANs (WLANs), Observer has updated a number of statistical modes and added some new ones. These new and updated features are described in the sections that follow.

### Wireless Access Point Statistics (New Mode)

This mode is available on the **Statistics** menu whenever Observer is analyzing through a wireless device or Probe.

The Access Point Statistics mode shows traffic passing through any Access Points (APs) visible to the Observer wireless NIC. This mode is an all-purpose tool for maintaining performance and security on a WLAN that uses APs, showing you:

- Wireless stations that are connected to an AP
- Non-wired stations that they communicate with
- Levels of signal strength, quality, data transfer rates, and non-data transfer rates on each station on the access point
- AP traffic totals

For example, you can immediately see if there is a station connected to the wrong AP, or if an unauthorized AP has been installed. AP statistics will display whether a station has a problem with quality or range of connection based on the number of reassociations and retransmissions, or whether a station is misconfigured based on station poll totals.

The table below describes each statistic.

Note that some columns are turned off by default; right click on the column heading to set which statistics you want to display.

Statistic	Description
Access Point	The MAC address of the Access Point for this row of statistics.
Station	The MAC address or alias of the station communicating with the AP.
Type	The type of device connected to the AP: aa wireless station, a station (unwired), or another Access Point.
Avg Strength (%)	The average strength of the signal, expressed as a percentage of the optimum strength.

Statistic	Description
Avg Quality (%)	The average signal-to-noise ratio of the signal, expressed as a percentage of the optimum.
Avg Data Rate	The average rate of data packets on the wireless network.
Avg Rate	The average rate of all packets (data+control+management+beacon) on the wireless network.
Packets	The total number of packets seen.
Data pkts (Directed)	The total number of data packets seen.
Multicasts	The total number of multicast packets seen.
Bytes	The total number of bytes seen.
CRC	The total number of CRC errors reported by the AP.
Retries	The total number of transmission retries reported by the AP.
Associations	The number of associations (connection sessions) that have been established with this AP.
Station Polls	The total number of poll requests by station; a high number means that a station cannot connect to an AP. In the 802.11b protocol, a station first polls for an AP, then associates with a responding AP.
Min Quality	The poorest quality signal seen, expressed as a percentage of the optimum.
Max Quality	The best quality signal seen, expressed as a percentage of the optimum.
Latest Quality	The quality of the signal as seen at the last poll.
Min Strength	The lowest strength signal seen, expressed as a percentage of the optimum.
Max Strength	The highest strength signal seen, expressed as a percentage of the optimum.
Latest Strength	The strength of the signal seen at the last poll.
Min Data Rate	The slowest data rate seen, expressed in Mbits/sec.
Max Data Rate	The fastest data rate seen, expressed in Mbits/sec.
Latest Data Rate	The data rate seen at the last poll.

Statistic	Description
Min Rate	The slowest rate of total packet throughput seen, expressed in Mbits/sec.
Max Rate	The fastest rate of total packet throughput seen, expressed in Mbits/sec.
Latest Rate	The rate of total packet throughput seen at the last poll.

## Wireless Channel Scan Monitor (New Tool)

The Wireless Channel Scan Monitor shows activity by channels on your wireless network. This mode is available on the **Tools** menu.

Two things to note about the channel scan monitor:

- You must set the channels to scan in the **Probe or Device Properties** dialog (see page 6 of this manual).
- When Observer is scanning channels, the other modes (such as Top Talkers, Access Point Statistics) will no longer be able to present complete view of the network, as Observer's data sample is limited to the current channel being scanned. Therefore, you should only use the Channel Scan monitor by itself.

The table below describes each Channel Scan Monitor statistic in detail.

Note that some fields are hidden by default; to reconfigure the display, right-click on the statistics column heading:

Statistic	Description
Channel	Channel being tracked in this row of data.
Avg Strength (%)	The average strength of the signal, expressed as a percentage of the optimum strength.
Avg Quality (%)	The average signal-to-noise ratio of the signal, expressed as a percentage of the optimum.
Avg Data Rate	The rate of data packets on the wireless network.
Avg Rate	The rate of all packets (data+control+management+beacon) on the wireless network.
CRC	Total number of CRC errors reported on this channel.

Statistic	Description
Packets	Total number of packets (data+control+management+beacon) seen.
Data pkts (directed)	Total number of data packets (packets with a payload and an address) seen.
Beacons	Total number of beacons seen.
Bytes	Total number of bytes seen.
Retries	Total number of retries reported on this channel.
Min Quality	The poorest quality signal seen, expressed as a percentage of the optimum.
Max Quality	The best quality signal seen, expressed as a percentage of the optimum.
Latest Quality	The quality of the signal as seen at the last poll.
Min Strength	The lowest strength signal seen, expressed as a percentage of the optimum.
Max Strength	The highest strength signal seen, expressed as a percentage of the optimum.
Latest Strength	The strength of the signal seen at the last poll.
Min Data Rate	The slowest data rate seen, expressed in Mbits/sec.
Max Data Rate	The fastest data rate seen, expressed in Mbits/sec.
Latest Data Rate	The data rate seen at the last poll.
Min Rate	The slowest rate of total throughput seen, expressed in Mbits/sec.
Max Rate	The fastest rate of total packet throughput seen, expressed in Mbits/sec.
Latest Rate	The rate of total packet throughput seen at the last poll.

## Network (Wireless) Vital Signs

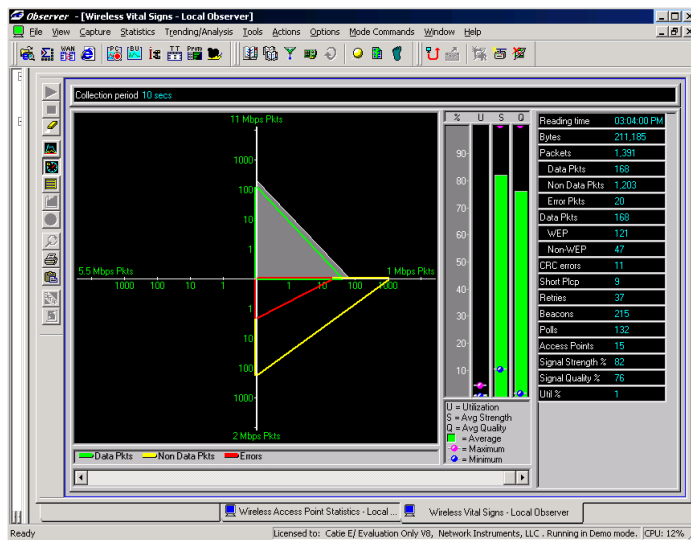
To start Vital Signs, select **Statistics** from the main menu, then **Network Vital Signs**.

The Wireless Vital Signs mode shows current wireless activity mapped with current wireless error conditions on your WLAN. The Vital Signs mode displays a comprehensive snapshot of error conditions and of their criticality in the context of current WLAN activity. To pin down aggregate problems

revealed by Wireless Vital Signs, go to Access Point Statistics, Top Talkers, and Errors by Station.

Another way to use this "at-a-glance" view of network health is to install Observer on a wireless laptop and watch what happens to the vital signs as you move the system around your office.

The display below shows the “dial view” of Wireless Vital Signs. Other views are available by clicking the different view buttons on the tool bar to the left of the graph display:



In Dial View, vital signs are plotted against 4 axes, each representing one of the four 802.11b-defined bit rates: 1, 2, 5.5, and 11 Mbits/sec. This allows you to see the relationships between:

- Data Packets (packets with a payload)
- Non-Data Packets (control, management, and beacon)
- Errors of all types, broken down by type in the table to the right of the graph display.

This lets you immediately see each statistic in its proper context. For example, an error rate of 50% is insignificant if Observer has only analyzed two packets, but quite significant if thousands of packets have been analyzed.

The bar graphs to the right of the dial show current bandwidth utilization (U), the average strength (S), and the average quality (Q) of the signal. These meters also indicate (with watermark “floats”) the minimum and maximum values that Observer has seen since the last polling period.

## Top Talkers (Three New tabs)

The Top Talkers statistical mode displays three tabs showing wireless data when Observer is capturing packets via the wireless NIC: Wireless Types, Wireless Speeds, and Wireless Latest. These tabs are described in detail below.

### Wireless Types

This display shows the type of each station sensed in the air: whether it is a LAN station talking over the air to wireless stations, a wireless station, or an AP. For stations, it shows which APs they are using. For APs, it displays the Service Set Identifier (SSID) and whether WEP is enabled on that AP. It also displays Control, Data and Management totals per station. As with other tabular displays in Observer, right-click on the column headings to configure the column view.

Statistic	Description
Alias	Alias of the Top Talker system, if one is available.
Address	Media Access Control (MAC) address, i.e., the “hardware address.”
Packets	The total number of packets sent by the system.
Management	The number of management packets sent by the system.
Control	The number of control packets sent by the system.
Data	The number of data packets sent by the system.
Probe Request	The number probe requests sent by the system.
Retries	The number of transmission retries sent by the system.
Type	The type of station: Wireless or Access Point
AP Used	The access point used by the system.

## Wireless Speeds

This tab shows details of signal strength, quality, the overall rate and data rate, as well as the packet distributions for different rates. As with all of the statistical displays in Observer, you can configure the mode to display only the statistics that you are currently interested in by right-clicking on the column headers.


Statistic	Description
Alias	Alias of the Top Talker system, if one is available.
Address	Media Access Control (MAC) address, i.e., the "hardware address."
Packets	The total number of packets sent by the system.
Avg Strength (%)	The average strength of the signal, expressed as a percentage of the optimum strength.
Avg Quality (%)	The average signal-to-noise ratio of the signal, expressed as a percentage of the optimum.
Avg Data Rate	The rate of data packets on the wireless network.
Avg speed	The speed of all packets (data+control+management+beacon) on the wireless network.
Util %	The percentage of bandwidth utilized.
Pkt 1	The number of packets captured at 1Mbit/sec.
Pkt 2	The number of packets captured at 2Mbit/sec.
Pkt 5.5	The number of packets captured at 5.5Mbit/sec.
Pkt 11	The number of packets captured at 11Mbit/sec.

## Wireless Latest

This tab shows the strength, quality, and speed of the wireless network, as seen at the last poll, as opposed to the other Top Talker displays, which present running *averages*.

## The Expert Analysis *Wireless Events* Button

Expert Mode can be used in both real time and post-capture:


- For real-time analysis, when capturing packets, select the View  icon from Packet Capture. Then select the **Expert Analysis** tab at the bottom of the decode display.
- For post-capture analysis, open a (previously captured) buffer and select the "Expert Analysis" tab at the bottom of the decode display.

The Expert Analysis tab includes a **Wireless Events** button on the toolbar along the left of the display. Observer tracks network conditions between wireless stations and logs:

- The station sending and the station receiving the wireless event.
- A color-coded status indicator showing the criticality of the event (each level of criticality can be configured by clicking the Expert Thresholds icon to the left of the Expert Analysis window).
- The number of packets going in each direction for the event.
- The number of association attempts from the sending and receiving stations.
- Cyclical Redundancy Check/Physical Layer Convergence Protocol (CRC/PLCP) errors reported on the sending and receiving stations.
- Equivalency Privacy (WEP) encryption/decryption errors reported on the sending and receiving stations.

Expert Analysis also displays the following conditions: weak signal and low signal quality per station, missed ACKs, failed associations, and whether WEP is used on a particular AP or station.

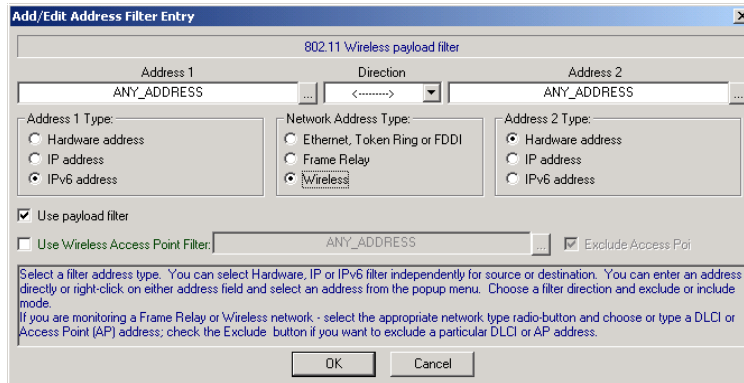
The tracked Wireless Events are described below.

Event	Description
Station 1-> <-Station 2	Shows the wireless station sending and the wireless station receiving. Where possible, the client is listed first and server second.
Status	<p>Displays a colored box indicating the status of the conversation. Red indicates a critical event has occurred. Yellow indicates a marginal event has occurred. Green indicates that the conversation's communication is within acceptable event parameters.</p> <p>A red or yellow status will display when any expert event for the pair occurs. You can customize the criticality thresholds by clicking the  Expert Thresholds icon to the left of the Expert Analysis window.</p>
Packets-> <-Packets	Displays the number of packets in each direction of the pair's communication.
Associations-> <-Associations	The number of association attempts from the sending and receiving stations.
CRC/PLCP Errors-> <-CRC/PLCP Errors	The number of cyclical redundancy check/physical layer convergence errors reported on the sending and receiving stations.
WEP Decode Errors-> <-WEP Decode Errors	The number of Wireless Equivalency Privacy encryption/decryption errors reported on the sending and receiving stations.

Note also that the Expert Summary now displays wireless events.

## New Filtering Enhancements

You can now filter by the wireless access point hardware address in addition to the standard MAC address and IP address filtering that has always been available in Observer. You can choose to either capture or exclude packets by the AP.



## Router Observer

Router Observer mode now shows statistics for wireless access points as well as routers.

## Save Capture Buffer

You can apply WEP decryption by supplying the key profiles in the Save Capture Buffer dialog. These are the same key profiles configured in the Device or Probe Properties dialog described on page 6 of this manual.

## Wireless Observer Troubleshooting

Most problems with wireless analysis are the result of problems unrelated to the Observer software or its configuration, such as unconfigured or incorrectly configured WEP keys. Make sure that you have the wireless NIC working with your network as described in the vendor supplied manuals **before** you install Observer or the Network Instruments custom NIC driver.

The table below describes some problems that you might run into, their likely causes, and the remedies to correct the problems.

Symptom	Possible Cause	Remedy
Observer does not display any protocol or IP statistics.	WEP not activated, or incorrect WEP key(s).	Configure the WEP key(s). See <b>Configuring Observer for Wireless Operation</b> on page 6 of this manual.
Expert Analysis doesn't display anything.	WEP not activated, or incorrect WEP key(s).	Configure the WEP key(s). See <b>Configuring Observer for Wireless Operation</b> on page 6 of this manual.
Network drive becomes disconnected after running Observer.	This can happen when you reconfigure the driver (either through vendor utilities or Windows) while Observer is running.	Use Explorer to reconnect to the drive.
Wireless NIC becomes dis-associated after running Observer	This can happen when you reconfigure the driver (either through vendor utilities or Windows) while Observer is running.	Re-install and configure the Network Instruments wireless analyzer driver.





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